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Stark Profile Measurement of The Lyman-α Line of Hydrogen*

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by

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A T-type electromagnetic shock tube[1] is used for the detailed study of Stark broadened lines in the vacuum ultraviolet. Measurements of the Lyman-α profile from an optically thin region (.03% hydrogen in 40 mm Hg helium) indicate agreement to within 10% with recent calculations,[2] as opposed to the Holtsmark theory which differs by a factor of ~2 on the wings. A temperature of $(20.5 \pm 2.0)\ 10^3\ ^\circ K$ has been determined from a line to continuum ratio measurement. Density measurements from the visible continuum give $N_e = (3.6 \pm 0.4)\ 10^{17}$. The Rankine-Hugoniot equations give $N_e = (4.8 \pm 1.9)\ 10^{17}$ and $T = (20.0 \pm 1.0)\ 10^3\ ^\circ K$. A calculated spectral emissivity of $0.09 \pm .06$ at 1217.7 Å compares to $0.10 \pm .02$ as found

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1. R. C. Elton, H. R. Griem, and A. C. Kolb, J. Opt.Soc. Am. 52, 605 (1962).

2. H. R. Griem, A. C. Kolb, K. Y. Shen, Phys. Rev. 116, 4 (1959).

experimentally by adding known amounts of hydrogen until blackbody saturation occurs. In this way it is possible to produce near blackbody radiation from homogeneous plasmas of controlled optical depths. Such plasmas can be used as intensity standards also at other wavelengths in the vacuum ultraviolet.